Claims:

1. A method of reading data coded with a Reed-Solomon error correcting code, said method comprising the steps of:

reading said data; and

performing a check sum calculation on said data;

wherein said check sum calculation includes applying a byte based polynomial remaindering process to the bytes of said data, the polynomial used in said polynomial remaindering process being primitive over $GF(2^8)$; and

the roots of the polynomial used in said polynomial remaindering process are different to the roots of a generator polynomial of said Reed-Solomon error correcting code.

2. The method as claimed in claim 1, wherein said polynomial is $X^2 + X\alpha^2 + \alpha$, where α is the primitive element $GF(2^8)$ used in the process of defining redundancy coding for individual data groups.

3. The method as claimed in claim 1, wherein said polynomial remaindering process is carried out using a sub function which contains a mask function which is the same as a mask function used in defining redundancy coding for a data group or groups and wherein the said data group or groups are redundancy coded using a Reed- Solomon code over $GF(2^8)$.

4. The method as claimed in claim 1, wherein said polynomial remaindering process is carried out using a sub function which contains a mask function which is the same as a mask function used in defining redundancy

coding for a data group or groups and wherein the said data group or groups are redundancy coded using a Reed- Solomon code over GF(2^8), said sub function for a byte of data determined by:

inputting said byte of data into an 8 bit shift register;

reading a most significant bit of said byte;

shifting said byte of data by one bit to obtain a shifted byte value;

setting a least significant bit of said shifted byte to value 0; and

if said most significant bit has a value 1, performing an exclusive OR of said shifted byte with a binary value 29.

5. A method of reading redundancy coded data coded with a Reed-Solomon error correcting code, said method comprising the steps of:

reading a group of said coded data;

performing an error correction on said coded data group, to produce a corrected data group; and

performing a check sum calculation on said error corrected data group;

wherein said check sum calculation includes applying a byte based polynomial remaindering process to the bytes of said corrected data group, the polynomial used in said polynomial remaindering process being primitive over GF(2^8); and

the roots of the polynomial used in said polynomial remaindering process are different to the roots of a generator polynomial of said Reed-Solomon error correcting code.

6. The method as claimed in claim 5, wherein said polynomial expression is $X^2 + X\alpha^2 + \alpha$,

where α is the primitive element of $GF(2^8)$ used in defining the redundancy coding for individual data groups.

7. The method as claimed in claim 5, wherein said polynomial remaindering process is carried out using a sub function which contains a mask function which is the same as a mask function used in defining redundancy coding for a data group or groups and wherein the said data group or groups are redundancy coded using a Reed- Solomon code over $GF(2^8)$.

8. The method as claimed in claim 5, wherein said polynomial remaindering process is carried out using a sub function which contains a mask function which is the same as a mask function used in defining redundancy coding for a data group or groups and wherein the said data group or groups are redundancy coded using a Reed- Solomon code over $GF(2^8)$, said sub function for a byte of data is determined by:

inputting said byte of data into an 8 bit shift register;

reading a most significant bit of said byte;

shifting said byte of data by one bit to obtain a shifted byte value;

setting a least significant bit of said shifted byte to value 0; and

if said most significant bit has a value 1, performing an exclusive OR of said shifted byte with a binary value 29.

9. A method of reading redundancy coded data comprising the steps of:

reading a plurality of groups of coded data;

performing error correction on each of said individual data groups of coded data to produce a plurality of corrected data groups;

performing a first check sum calculation on each of said plurality of corrected data groups;

performing further error correction on said plurality of corrected data groups; and

performing the same check sum calculations as previously performed on the individual corrected data groups;

wherein at least one of said check sum calculations includes applying a byte based polynomial remaindering process to the bytes of said corresponding respective corrected data groups; wherein

the polynomial used in said polynomial remaindering process is primitive over GF(2^8), the Galois field containing 256 elements; and

roots of the polynomial used in said polynomial remaindering process are different to the roots of a generator polynomial of a Reed-Solomon error correcting code used in generating said redundancy coded data.

10. The method as claimed in claim 9, wherein said polynomial expression is $X^2 + X\alpha^2 + \alpha$,

where α is the primitive element of $GF(2^8)$ used in the process of defining the redundancy coding for individual data groups.

11. The method as claimed in claim 9, wherein said polynomial remaindering process is carried out using a sub function which contains a mask function which is the same as a mask function used in defining the redundancy coding for said data group or groups and wherein the said data group or groups are redundancy coded using a Reed- Solomon code over $GF(2^8)$.

12. The method as claimed in claim 9, wherein said polynomial remaindering process is carried out using a sub function which contains a mask function which is the same as a mask function used in defining the redundancy coding for said data group or groups and wherein the said data group or groups are redundancy coded using a Reed- Solomon code over $GF(2^8)$, said sub function for a byte of data determined by:

inputting said byte of data into an 8 bit shift register;

reading a most significant bit of said byte;

shifting said byte of data by one bit to obtain a shifted byte value;

setting a least significant bit of said shifted byte to value 0; and

if said most significant bit has a value 1, performing an exclusive OR of said shifted byte with a binary value 29.

13. The method as claimed in claim 9, where said check sum calculations operate with a probability of failing to detect a random mis-correct error in one or more data groups of 1 in 2^{16}.

14. The method as claimed in claim 9, wherein for mis-correction errors of minimum Hamming weight occurring in user data the probability of detecting such mis-correction errors is substantially 1.

15. The method as claimed in claim 9, having a probability of failing to detect mis-correction errors of substantially 1 in 2^{16}.

16. A digital data storage device capable of reading a magnetic tape data storage medium comprising a plurality of data tracks written across a width of said tape in a direction transverse to a main length of said tape, said data storage device comprising a read channel capable of implementing a method as described in claim 1.

17. An apparatus for reading data coded with a Reed - Solomon error correcting code, said apparatus comprising:

a reader for reading data; and

a check sum calculator for performing a check sum calculation on the data,

wherein said check sum calculation includes applying a byte based polynomial remaindering process to the bytes of said data, wherein a polynomial used in said polynomial remaindering process is primitive over $GF(2^8)$; and

the roots of a polynomial used in said polynomial remaindering process are different to the roots of a generator polynomial of said Reed-Solomon error correcting code.

18. The apparatus as claimed in claim 17, wherein said polynomial is $X^2 + X\alpha^2 + \alpha$,

where α is the primitive element of $GF(2^8)$ used in the process of defining the redundancy coding for individual data groups.

19. The apparatus as claimed in claim 17, wherein said polynomial remaindering process is carried out using a sub function which contains a mask function which is the same as a mask used in function defining redundancy coding for a data group or groups and wherein said data group or groups are redundancy coded using a Reed- Solomon code over $GF(2^8)$.

20. The apparatus as claimed in claim 17, wherein said polynomial remaindering process is carried out using a sub function which contains a mask function which is the same as a mask used in defining redundancy coding for a data group or groups and wherein the said data group or groups are redundancy coded using a Reed-Solomon code over $GF(2^8)$, wherein the said sub function is determined by:

inputting said byte of data into an 8 bit shift register;

reading a most significant bit of said byte;

shifting said byte of data by one bit to obtain a shifted byte value;

setting a least significant bit of said shifted byte to value 0; and

if said most significant bit has a value 1, performing an exclusive OR of said shifted byte with a binary value 29.

21. An apparatus for reading redundancy coded data coded with a Reed- Solomon error correcting code, said apparatus comprising:

a reader for reading data;

an error corrector for performing error correction on said data; and

a check sum calculator for performing a checksum calculation on the data; wherein

said reader operates to read a group of redundancy coded data;

said error corrector operates to produce corrected data;

said check sum calculator includes the application of a byte based polynomial remaindering process to the bytes of said corrected data group, wherein a polynomial used in said polynomial remaindering process is primitive over $GF(2^8)$; and

the roots of a polynomial used in said polynomial remaindering process are different to the roots of a generator polynomial of said Reed-Solomon error correcting code.

22. The apparatus as claimed in claim 21, wherein said polynomial is $X^2 + X\alpha^2 + \alpha$,

where α is the primitive element of $GF(2^8)$ used in the process of defining the redundancy coding for individual data groups.

23. The apparatus as claimed in claim 21, wherein said polynomial remaindering process is carried out using a sub function which contains a mask function which is the same as a mask function used in defining redundancy coding for a data group or groups and wherein the said data group or groups are redundancy coded using a Reed- Solomon code over $GF(2^8)$.

24. The apparatus as claimed in claim 21, wherein said polynomial remaindering process is carried out using a sub function which contains a mask function which is the same as a mask used in defining redundancy coding for a data group or groups and wherein the said data group or groups are redundancy coded using a Reed-Solomon code over $GF(2^8)$, wherein the said sub function is determined by:

inputting said byte of data into an 8 bit shift register;

reading a most significant bit of said byte;

shifting said byte of data by one bit to obtain a shifted byte value;

setting a least significant bit of said shifted byte to value 0; and

if said most significant bit has a value 1, performing an exclusive OR of said shifted byte with a binary value 29.

25. An apparatus for reading redundancy coded data, said apparatus comprising:

a reader for reading a plurality of groups of coded data;

a first error corrector for performing error correction on individual said data groups of coded data to produce a plurality of corrected data groups;

a first check sum calculator for performing a first check sum calculation on each of said plurality of corrected data groups;

a second error corrector for performing further error correction on the plurality of corrected data groups;

a second check sum calculator for performing the same check sum calculations as previously performed on the individual corrected data groups,

wherein at least one of said check sum calculations includes applying a byte based polynomial remaindering process to the bytes of said corresponding respective corrected data groups, wherein a polynomial used in said polynomial remaindering process is primitive over $GF(2^8)$; and

the roots of a polynomial used in said polynomial remaindering process are different to the roots of a generator polynomial of a Reed-Solomon error correcting code.

26. The apparatus as claimed in claim 21, wherein said polynomial expression is $X^2 + X\alpha^2 + \alpha$,

where α is the primitive element of $GF(2^8)$ used in the process of defining the redundancy coding for individual data groups.

27. The apparatus as claimed in claim 21, wherein said polynomial remaindering process is carried out using a sub function which contains a mask function which is the same as a mask used in function defining redundancy coding for a data group or groups and wherein said data group or groups are redundancy coded using a Reed- Solomon code over $GF(2^8)$.

28. The apparatus as claimed in claim 21, wherein said polynomial remaindering process is carried out using a sub function which contains a mask function which is the same as a mask used in defining redundancy coding for a data group or groups and wherein said data group or groups are redundancy coded using a Reed-Solomon code over $GF(2^8)$, wherein the said sub function is determined by:

inputting said byte of data into an 8 bit shift register;

reading a most significant bit of said byte;

shifting said byte of data by one bit to obtain a shifted byte value;

setting a least significant bit of said shifted byte to value 0; and

if said most significant bit has a value 1, performing an exclusive OR of said shifted byte with a binary value 29.

29. The apparatus as claimed in claim 21, wherein said check sum calculations operate with a probability of failing to detect a random mis-correct error in one or more data groups of 1 in 2^{16}.

30. The apparatus as claimed in claim 21, wherein for mis-correction errors of minimum Hamming weight occurring in user data the probability of detecting such mis-correction errors is substantially 1.

31. The apparatus as claimed in claim 21, operating with a probability of failing to detect mis-correction errors of substantially 1 in 2^{16}.